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EXAMINER	
CORBETT, JOHN M	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/596,151	MANZKE ET AL.	
	Examiner	Art Unit	
	JOHN M. CORBETT	2882	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02 July 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,5-15 and 17-20* is/are rejected.

7)☒ Claim(s) *2-4 and 16* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *02 July 2008* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claim 14 is objected to because of the following informalities, which appear to be minor draft errors including grammatical and/or lack of antecedent basis problems.

In the following format (location of objection; suggestion for correction), the following correction(s) may obviate the objection(s):

(Claim 14, line 1, "The method of claim 14" was claimed, perhaps "The method of claim 1" was meant).

For examination purposes, the claim has been treated as such.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 9-11 and 13 are rejected under 35 U.S.C. 102(b) as being anticipated by Flohr et al. (6,381,487).

With respect to claim 1, Flohr et al. discloses a computer tomography method having the following steps:

a) generation by a beam source (1) of a beam bundle (2) passing through a periodically moving object (5),

b) generation of a relative movement (via 8) between the beam source on the one hand and the object on the other hand (Col. 6, lines 40-45), which comprises a rotation about an axis of rotation (z-axis),

c) acquisition by means of a detector unit (3), during the relative movement, of measured values that are dependent on the intensity in the beam bundle on the other side of the object (Col. 6, lines 53-55), an acquisition time being allocated to each measured value and to the beam causing the respective measured value (Col. 7, lines 19-28),

d) detection of a movement signal depending on the movement of the object by means of a movement-detection device (17) and determination of periods of the periodic movement by means of the detected movement signal (Col. 7, lines 19-28),

e) reconstruction (via 11) of a computer tomography image of the object from the measured values (Col. 6, lines 53-62), wherein only measured values whose acquisition times lie within the periods (Figure 1) in time intervals (Figures 2, 4 and 5) are used, which are so determined that a similarity measure applied to intermediate images of a same subregion of the object is minimized (Col. 5, line 66 – Col. 6, line 7), wherein different intermediate images are reconstructed using measured values from time intervals from different periods (Col. 3, line 59 – Col. 4, line 7, Col. 4, lines 31-49 and Figures 3-4).

With respect to claim 9, Flohr et al. further discloses the detected movement signal is an electrocardiogram (17).

With respect to claim 10, Flohr et al. further discloses a period determined in step d) corresponds to the distance of time between two adjacent R-peaks of the electrocardiogram (Figures 3 and 4).

With respect to claim 11, Flohr et al. further discloses an apparatus (Figure 10) having

a beam source (1) for generating a beam bundle (2) passing through (Figure 10) a periodically moving object (5),

a drive arrangement (13) for generating a relative movement between the beam source on the one hand and the object on the other hand, which comprises a rotation about an axis of rotation (z),

a detector unit (3) for acquiring measured values that depend on the intensity in the beam bundle on the other side of the object, during the relative movement, wherein an acquisition instant is allocated to each measured value and to the beam causing the respective measured value (Col. 6, lines 53-55),

a movement-detecting device (17), an electrocardiograph, for detecting periods of the periodic movement by means of a movement signal depending on the movement of the object,

a reconstruction unit (11) for reconstruction of a computer tomography image of the object from the measured values (Col. 6, lines 55-62),

a control unit (computer) for necessarily controlling the beam source, the drive arrangement, the detector unit, the movement-detection device and the reconstruction unit in accordance with the following steps:

a) generation by a beam source of a beam bundle passing through a periodically moving object (Col. 6, line 28 – Col. 7, line 37 and Figure 10),

b) generation of a relative movement between the beam source on the one hand and the object on the other band, which comprises a rotation about an axis of rotation (Col. 6, line 28 – Col. 7, line 37 and Figure 10),

c) acquisition by means of a detector unit, during the relative movement, of measured values that are dependent on the intensity in the beam bundle on the other side of the object, an acquisition time being allocated to each measured value and to the beam causing the respective measured value (Col. 6, line 28 – Col. 7, line 37 and Figure 10),

d) detection of a movement signal depending on the movement of the object by means of a movement-detection device and determination of periods of the periodic movement by means of the detected movement signal (Col. 6, line 28 – Col. 7, line 37 and Figure 10),

e) reconstruction of a computer tomography image of the object from the measured values (Col. 6, line 28 – Col. 7, line 37 and Figure 10), wherein only measured values whose acquisition times lie within the periods (Figure 1) in time intervals (Figures 2, 4 and 5) are used, which are so determined that a similarity measure applied to intermediate images of a same subregion of the object is minimized (Col. 5, line 66 – Col. 6, line 7), wherein different intermediate images are reconstructed using measured values from time intervals from different periods (Col. 3, line 59 – Col. 4, line7, Col. 4, lines 31-49 and Figures 3-4).

With respect to claim 13, Flohr et al. further discloses the movement-detecting device is an electrocardiograph (Col. 2, lines 42-44).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 5 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Flohr et al. as applied to claim 1 above, and further in view of Rasche et al. (WO02/103639 A2).

With respect to claim 5, Flohr et al. discloses the method as recited above.

Flohr et al. further discloses the application of the similarity measure to two intermediate images of the same subregion comprises the following steps:

subtraction (Col. 5, lines 28-30) of an image value of a region from the one intermediate image from an image value of the same region from the other intermediate image for each subdivision region (Col. 5, line 66- Col. 6, line 5) to form a respective absolute difference,

summation of the absolute differences, wherein the resulting sum is the similarity value of the similarity measure (Equation 3).

Flohr et al. fails to disclose division of the subregion into several subdivision regions.

Rasche et al. teaches division of the subregion into several subdivision regions (Page 6, lines 6-7).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method of Flohr et al. to include the subdivision of Rasche et al., since a person would have been motivated to make such a modification to increase available information by accounting for different individual parts of the heart that move to different extents at different instants (Page 1, line 9) as taught by Rasche et al.

With respect to claim 8, Flohr et al. discloses the method as recited above.

Flohr et al. fails to disclose the intermediate images are reconstructed with a lower spatial resolution than the CT image.

Rasche et al. teaches the intermediate images are reconstructed with a lower spatial resolution than the CT image (Abstract).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method of Flohr et al. to include the lower spatial resolution of Rasche et al., since a person would have been motivated to make such a modification to reduce computation time (page 3, line 30 – Page 4, line 4) as taught by Rasche et al.

4. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Flohr et al. as applied to claim 1 above, and further in view of Taguchi et al. ("High temporal resolution for multislice helical computed tomography", 2000, Medical Physics, Volume 27, Number 5, Pages 861-872).

With respect to claim 6, Flohr et al. discloses the method as recited above.

Flohr et al. fails to disclose the measured values whose acquisition instants lie in a time interval are weighted before the reconstruction of the intermediate images and the CT image, with a weighting that decreases in size the further away from the middle of a time intervals the acquisition instant of a measured value lies.

Taguchi et al. teaches disclose the measured values whose acquisition instants lie in a time interval are weighted before the reconstruction of the intermediate images and the CT image, with a weighting that decreases in size the further away from the middle of a time intervals the acquisition instant of a measured value lies (Abstract, line 7 and Figure 2).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method of Flohr et al. to include the weighting of Taguchi et al., since a person would have been motivated to make such a modification to improve image quality for many applications which requires high temporal resolution such as cardiac imaging (Page 871, Col. 1, lines 26-29) as taught by Taguchi et al.

5. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Flohr et al. as applied to claim 1 above, and further in view of Bruder et al. (20030072419).

With respect to claim 7, Flohr et al. discloses the method as recited above.

Flohr et al. fails to disclose the reconstruction of the intermediate images and/or the CT image is effected with a filtered back-projection.

Bruder et al. teaches the reconstruction of the intermediate images and/or the CT image is effected with a filtered back-projection (Paragraph 28).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method of Flohr et al. to include the filtered back-projection of Bruder et al., since a person would have been motivated to make such a modification to simplify the reconstruction process by utilizing a mature, well understood standard reconstruction method (Paragraph 28) as implied by Bruder et al.

6. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Flohr et al. as applied to claim 1 above, and further in view of Hsieh (6,529,575).

With respect to claim 12, Flohr et al. further discloses the method as recited above.

Flohr et al. fails to explicitly disclose a computer readable storage medium encoded with instructions that when executed by a computer cause the computer to control a beam source, a drive device, a detector unit, a movement-detection device and a reconstruction unit of a computer tomograph for implementing a method.

Hsieh teaches teach a computer readable storage medium encoded with instructions that when executed by a computer cause the computer to control a beam source, a drive device, a detector unit, a movement-detection device and a reconstruction unit of a computer tomograph for implementing a method (Col. 8, line 57 - Col. 9, line 12).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the configuration of Flohr et al. to include the computer readable storage

medium of Hsieh, since a person would have been motivated to make such a modification to improve usability of the configuration by more easily update existing systems to implement the invention (Col. 8, line 66 - Col. 9, line 1) as taught by Hsieh.

7. Claims 14-15 and 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Drummond et al. (US 6,628,743 B1) in view of Okerlund et al. (US 6,526,117 B1) and Breeuwer (US 2002/0136438).

With respect to claim 14, Drummond et al. discloses a computer tomography (Figures 1-2) method having the following steps:

a) generation by a beam source (120) of a beam bundle (130) passing through (Figure 2) a periodically moving object (Abstract, patient's heart),

b) generation of a relative movement between the beam source on the one hand and the object on the other hand (Figures 1-2), which comprises a rotation about an axis of rotation (180),

c) acquisition by means of a detector unit (140), during the relative movement, of measured values that are dependent on the intensity in the beam bundle on the other side of the object, an acquisition time being allocated to each measured value and to the beam causing the respective measured value (Col. 4, lines 42-51),

d) detection of a movement signal (Col. 4, lines 23-24) depending on the movement of the object by means of a movement-detection device (292) and determination of periods of the periodic movement by means of the detected movement signal (Col. 4, lines 42-46),

e) reconstruction of a computer tomography image of the object from the measured values, measured values whose acquisition times lie within the periods in time intervals are used (Col. 4, lines 42-46), different intermediate images are reconstructed using measured values from time intervals from different periods (160 and 170).

Drummond et al. fails to explicitly disclose only measured values whose acquisition times lie within the periods in time intervals are used.

Drummond et al. fails to disclose determined that a similarity measure applied to intermediate images of a same subregion of the object is minimized.

Drummond et al. further fails to disclose each intermediate image is reconstructed with data only from a time interval within a corresponding different one of the periods in time.

Okerlund et al. teaches only measured values whose acquisition times lie within the periods in time intervals are used (Col. 7, line 64 – Col. 8, line 3 and Figures 4-5).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method of Drummond et al. to include the measured values of Okerlund et al., since a person would have been motivated to make such a modification to improve imaging by identifying the best aligned image sets to obtain better diagnostic characteristics (Col. 9, lines 48-51) as taught by Okerlund et al.

Okerlund et al. further teaches similarity measure applied to intermediate images of a subregion of the object is minimized (Col. 11, lines 5-19).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the method of Drummond et al. as modified above the measured of Okerlund et al., since a person would have been motivated to make such a modification to

improve imaging by identifying the best aligned image (optimal registration) sets to obtain better diagnostic characteristics (Col. 9, lines 48-51 and Col. 11, lines 18-19) as taught by Okerlund et al.

Okerlund et al. further teaches each intermediate image is reconstructed with data only from a time interval within a corresponding different one of the periods in time (Col. 4, lines 56-65 and Col. 7, line 64 – Col. 8, line 3 and Figures 4-6).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the method of Drummond et al. as modified above the data grouping of Okerlund et al., since a person would have been motivated to make such a modification to improve imaging by minimizing motion artifacts of a non-precisely periodically moving object (Col. 4, lines 1-6) as implied by Okerlund et al.

Breeuwer teaches determined that a similarity measure applied to intermediate images of a same subregion of the object is minimized (Paragraphs 3 and 5).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the system and method of Drummond et al. as modified above the same subregion measure of Breeuwer, since a person would have been motivated to make such a modification to improve imaging by utilizing only those measurements which would provide for reliable data for analysis (Paragraph 5) as taught by Breeuwer.

With respect to claim 15, Drummond et al. discloses a computer tomography (Figures 1-2) method having the following steps:

a) generation by a beam source (120) of a beam bundle (130) passing through (Figure 2) a periodically moving object (Abstract, patient's heart),

b) generation of a relative movement between the beam source on the one hand and the object on the other hand (Figures 1-2), which comprises a rotation about an axis of rotation (180),

c) acquisition by means of a detector unit (140), during the relative movement, of measured values that are dependent on the intensity in the beam bundle on the other side of the object, an acquisition time being allocated to each measured value and to the beam causing the respective measured value (Col. 4, lines 42-51),

d) detection of a movement signal (Col. 4, lines 23-24) depending on the movement of the object by means of a movement-detection device (292) and determination of periods of the periodic movement by means of the detected movement signal (Col. 4, lines 42-46),

e) reconstruction of a computer tomography image of the object from the measured values, measured values whose acquisition times lie within the periods in time intervals are used (Col. 4, lines 42-46), different intermediate images are reconstructed using measured values from time intervals from different periods (160 and 170).

Drummond et al. fails to explicitly disclose only measured values whose acquisition times lie within the periods in time intervals are used.

Drummond et al. fails to disclose determined that a similarity measure applied to intermediate images of a same subregion of the object is minimized and each intermediate image is reconstructed with data only from a time interval within a corresponding different one of the periods in time.

Drummond et al. further fails to disclose each period in time corresponds to a different R-R periods.

Okerlund et al. teaches only measured values whose acquisition times lie within the periods in time intervals are used (Col. 7, line 64 – Col. 8, line 3 and Figures 4-5).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method of Drummond et al. to include the measured values of Okerlund et al., since a person would have been motivated to make such a modification to improve imaging by identifying the best aligned image sets to obtain better diagnostic characteristics (Col. 9, lines 48-51) as taught by Okerlund et al.

Okerlund et al. further teaches similarity measure applied to intermediate images of a subregion of the object is minimized (Col. 11, lines 5-19).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the method of Drummond et al. as modified above the measured of Okerlund et al., since a person would have been motivated to make such a modification to improve imaging by identifying the best aligned image (optimal registration) sets to obtain better diagnostic characteristics (Col. 9, lines 48-51 and Col. 11, lines 18-19) as taught by Okerlund et al.

Okerlund et al. further teaches each period in time corresponds to a different R-R periods (Figure 5).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the method of Drummond et al. as modified above the different periods Okerlund et al., since a person would have been motivated to make such a modification to

improve imaging by utilizing scanning parameters that insure that sufficient data needed to perform a reconstruction is acquired during a single diastolic phase thus insuring that gaps in reconstructed data are not present (Col. 7, line 64 – Col. 8, line 18) as implied by Okerlund et al.

Breeuwer teaches determined that a similarity measure applied to intermediate images of a same subregion of the object is minimized (Paragraphs 3 and 5).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the system and method of Drummond et al. as modified above the same subregion measure of Breeuwer, since a person would have been motivated to make such a modification to improve imaging by utilizing only those measurements which would provide for reliable data for analysis (Paragraph 5) as taught by Breeuwer.

With respect to claims 19-20, Drummond et al. discloses an imaging system (Figures 1 and 2) and method, comprising:

a source (120) that generates radiation (130) that traverses (Figure 2) a periodically moving object (Abstract, a patient's heart), wherein the source rotates (Figures 1 and 2) about an axis of rotation (180);

a detector (140) that detects radiation traversing the object;

a movement-detection device (292) that detects a movement signal indicative of a movement of the periodically moving object and determines periods of periodic movement based on the signal (Col. 4, lines 42-46); and

a reconstructor (240) that reconstructs an intermediate image (160) for a period and a consecutive intermediate image for a different period (170).

Drummond et al. fails to disclose reconstructs an intermediate image for each period, each image for each period is reconstructed with data from a time interval of the corresponding period, and the time interval is selected such that a similarity measure between two consecutive images for two different periods satisfies threshold criteria.

Okerlund et al. teaches reconstructs an intermediate image (106, 108, ..., 118, Col. 8, lines 5-18 and Col. 10, lines 32-47) for each period (DP1, DP2, ...), each image for each period is reconstructed with data from a time interval of the corresponding period (Col. 8, lines 5-18 and Figure 5), and the time interval is selected such that a similarity measure between two consecutive images for two different periods (Col. 10, line 49 – Col. 11, line 19).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the system and method of Drummond et al. to include the selecting of Okerlund et al., since a person would have been motivated to make such a modification to improve imaging by identifying an optimal working image set that is best for determining diagnostic characteristics (Col. 9, lines 48-51) as taught by Okerlund et al.

Breeuwer teaches satisfies threshold criteria (Abstract).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the system and method of Grass et al. as modified above the threshold of Breeuwer, since a person would have been motivated to make such a modification to improve imaging by utilizing data which is considered to be reliable and accurately registered (Paragraph 15) as taught by Breeuwer.

8. Claims 17-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Drummond et al. in view of Okerlund et al., Breeuwer and Brown ("A Survey of Image Registration Techniques", 1992, ACM Computing Surveys, Volume 24, Number 4, Pages 325-376).

With respect to claim 17, Drummond et al. discloses a computer tomography (Figures 1-2) method having the following steps:

a) generation by a beam source (120) of a beam bundle (130) passing through (Figure 2) a periodically moving object (Abstract, patient's heart),

b) generation of a relative movement between the beam source on the one hand and the object on the other hand (Figures 1-2), which comprises a rotation about an axis of rotation (180),

c) acquisition by means of a detector unit (140), during the relative movement, of measured values that are dependent on the intensity in the beam bundle on the other side of the object, an acquisition time being allocated to each measured value and to the beam causing the respective measured value (Col. 4, lines 42-51),

d) detection of a movement signal (Col. 4, lines 23-24) depending on the movement of the object by means of a movement-detection device (292) and determination of periods of the periodic movement by means of the detected movement signal (Col. 4, lines 42-46),

e) reconstruction of a computer tomography image of the object from the measured values, measured values whose acquisition times lie within the periods in time intervals are used (Col. 4, lines 42-46), different intermediate images are reconstructed using measured values from time intervals from different periods (160 and 170).

Drummond et al. fails to explicitly disclose only measured values whose acquisition times lie within the periods in time intervals are used.

Drummond et al. fails to disclose determined that a similarity measure applied to intermediate images of a same subregion of the object is minimized and each intermediate image is reconstructed with data only from a time interval within a corresponding different one of the periods in time.

Drummond et al. further fails to disclose the application of the similarity measure to two intermediate images of the same subregion comprises the following steps:

> division of the subregion into several subdivision regions,
>
> subtraction of an image value of a subdivision region from the one intermediate image from an image value of the same subdivision region from the other intermediate image for each subdivision region to form a respective absolute difference,
>
> summation of the absolute differences, the resulting sum is the similarity value of the similarity measure; and

a first of the two intermediate images is reconstructed with data only from one of the different periods and a second of the two intermediate images is reconstructed with data only from the other of the different periods.

Okerlund et al. teaches only measured values whose acquisition times lie within the periods in time intervals are used (Col. 7, line 64 – Col. 8, line 3 and Figures 4-5).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method of Drummond et al. to include the measured values of Okerlund et al., since a person would have been motivated to make such a modification to improve

imaging by identifying the best aligned image sets to obtain better diagnostic characteristics (Col. 9, lines 48-51) as taught by Okerlund et al.

Okerlund et al. further teaches similarity measure applied to intermediate images of a subregion of the object is minimized (Col. 11, lines 5-19).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the method of Drummond et al. as modified above the measured of Okerlund et al., since a person would have been motivated to make such a modification to improve imaging by identifying the best aligned image (optimal registration) sets to obtain better diagnostic characteristics (Col. 9, lines 48-51 and Col. 11, lines 18-19) as taught by Okerlund et al.

Breeuwer teaches determined that a similarity measure applied to intermediate images of a same subregion of the object is minimized (Paragraphs 3 and 5).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the system and method of Drummond et al. as modified above the same subregion measure of Breeuwer, since a person would have been motivated to make such a modification to improve imaging by utilizing only those measurements which would provide for reliable data for analysis (Paragraph 5) as taught by Breeuwer.

Brown teaches the application of the similarity measure to two intermediate images of the same subregion comprises the following steps:

division of the subregion into several subdivision regions,

subtraction of an image value of a subdivision region from the one intermediate image from an image value of the same subdivision region from the other intermediate image for each subdivision region to form a respective absolute difference, and

summation of the absolute differences, the resulting sum is the similarity value of the similarity measure (Page 344, Col. 1, lines 9-20).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the method of Drummond et al. as modified above the similarity technique of Brown, since a person would have been motivated to make such a modification to improve imaging by reducing computational times by utilizing a computationally simple and therefore more efficient similarity technique (Page 344, Col. 1, line 16, Table 7 and Page 367, Col. 1, lines 46-47) as taught by Brown.

Okerlund et al. teaches a first of the two intermediate images is reconstructed with data only from one of the different periods and a second of the two intermediate images is reconstructed with data only from the other of the different periods (Col. 7, line 64 – Col. 8, line 3 and Figures 4-5).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method of Drummond et al. to include the data of Okerlund et al., since a person would have been motivated to make such a modification to improve imaging by identifying the best aligned image sets to obtain better diagnostic characteristics (Col. 9, lines 48-51) as taught by Okerlund et al.

With respect to claim 18, Drummond et al. discloses a computer tomography (Figures 1-2) method having the following steps:

a) generation by a beam source (120) of a beam bundle (130) passing through (Figure 2) a periodically moving object (Abstract, patient's heart),

b) generation of a relative movement between the beam source on the one hand and the object on the other hand (Figures 1-2), which comprises a rotation about an axis of rotation (180),

c) acquisition by means of a detector unit (140), during the relative movement, of measured values that are dependent on the intensity in the beam bundle on the other side of the object, an acquisition time being allocated to each measured value and to the beam causing the respective measured value (Col. 4, lines 42-51),

d) detection of a movement signal (Col. 4, lines 23-24) depending on the movement of the object by means of a movement-detection device (292) and determination of periods of the periodic movement by means of the detected movement signal (Col. 4, lines 42-46),

e) reconstruction of a computer tomography image of the object from the measured values, measured values whose acquisition times lie within the periods in time intervals are used (Col. 4, lines 42-46), different intermediate images are reconstructed using measured values from time intervals from different periods (160 and 170).

Drummond et al. fails to explicitly disclose only measured values whose acquisition times lie within the periods in time intervals are used.

Drummond et al. fails to disclose determined that a similarity measure applied to intermediate images of a same subregion of the object is minimized and each intermediate image

is reconstructed with data only from a time interval within a corresponding different one of the periods in time.

Drummond et al. further fails to disclose the application of the similarity measure to two intermediate images of the same subregion comprises the following steps:

division of the subregion into several subdivision regions,

subtraction of an image value of a subdivision region from the one intermediate image from an image value of the same subdivision region from the other intermediate image for each subdivision region to form a respective absolute difference,

summation of the absolute differences, the resulting sum is the similarity value of the similarity measure; and

each region corresponds to a different voxel.

Okerlund et al. teaches only measured values whose acquisition times lie within the periods in time intervals are used (Col. 7, line 64 – Col. 8, line 3 and Figures 4-5).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method of Drummond et al. to include the measured values of Okerlund et al., since a person would have been motivated to make such a modification to improve imaging by identifying the best aligned image sets to obtain better diagnostic characteristics (Col. 9, lines 48-51) as taught by Okerlund et al.

Okerlund et al. further teaches similarity measure applied to intermediate images of a subregion of the object is minimized (Col. 11, lines 5-19).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the method of Drummond et al. as modified above the measured of

Okerlund et al., since a person would have been motivated to make such a modification to improve imaging by identifying the best aligned image (optimal registration) sets to obtain better diagnostic characteristics (Col. 9, lines 48-51 and Col. 11, lines 18-19) as taught by Okerlund et al.

Breeuwer teaches determined that a similarity measure applied to intermediate images of a same subregion of the object is minimized (Paragraphs 3 and 5) and each region corresponds to a different voxel (Paragraphs 8, 12, 26 and 28).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the system and method of Drummond et al. as modified above the same subregion measure and other teachings of Breeuwer, since a person would have been motivated to make such a modification to improve imaging by utilizing only those measurements which would provide for reliable data for analysis (Paragraph 5) as taught by Breeuwer.

Brown teaches the application of the similarity measure to two intermediate images of the same subregion comprises the following steps:

division of the subregion into several subdivision regions,

subtraction of an image value of a subdivision region from the one intermediate image from an image value of the same subdivision region from the other intermediate image for each subdivision region to form a respective absolute difference, and

summation of the absolute differences, the resulting sum is the similarity value of the similarity measure (Page 344, Col. 1, lines 9-20).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the method of Drummond et al. as modified above the similarity

technique of Brown, since a person would have been motivated to make such a modification to improve imaging by reducing computational times by utilizing a computationally simple and therefore more efficient similarity technique (Page 344, Col. 1, line 16, Table 7 and Page 367, Col. 1, lines 46-47) as taught by Brown.

9. Claims 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Grass et al. ("Automatic Phase Point Determination for High-Resolution Cardiac CT Reconstruction", 1 December 2003, RSNA 2003, Abstract code E08-462) in view of Breeuwer (US 2002/0136438 A1).

With respect to claims 19-20, Grass et al. discloses an imaging system (MX 8000 IDT, Philips Medical Systems) and method, comprising:

a source that generates radiation that traverses a periodically moving object (heart), wherein the source rotates about an axis of rotation (MX 8000 IDT, Philips Medical Systems);

a detector that detects radiation traversing the object (MX 8000 IDT, Philips Medical Systems);

a movement-detection device (ECG) that detects a movement signal indicative of a movement of the periodically moving object and determines periods of periodic movement based on the signal (Abstract); and

a reconstructor (MX 8000 IDT, Philips Medical Systems) that reconstructs an intermediate image for each period (low-resolution volumetric data sets), each image for each period is reconstructed with data from a time interval of the corresponding period (retrospective

gating), and the time interval is selected such that a similarity measure between two consecutive images for two different periods (Abstract).

Grass et al. fails to explicitly disclose satisfies threshold criteria.

Breeuwer teaches satisfies threshold criteria (Abstract).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the system and method of Grass et al. to include the threshold of Breeuwer, since a person would have been motivated to make such a modification to improve imaging by utilizing data which is considered to be reliable and accurately registered (Paragraph 15) as taught by Breeuwer.

Response to Arguments

10. Applicant's arguments with respect to claims 13-15 and 17-20 have been considered but are moot in view of the new ground(s) of rejection.

11. Regarding Applicant's arguments filed 2 July 2008:

Applicant's arguments, see Page 11, lines 22-26, filed 2 July 2008, with respect to the objection of the Specification have been fully considered and are persuasive. The objection of Specification has been withdrawn.

Applicant's arguments, see Page 12, lines 1-4, filed 2 July 2008, with respect to the drawing objection of Figure 1 have been fully considered and are persuasive. The objection of Figure 1 has been withdrawn.

Applicant's arguments, see Page 12, lines 7-9, filed 2 July 2008, with respect to the 35 U.S.C. 101 rejection of at least claim 12 have been fully considered and are persuasive. The rejection of at least claim 12 has been withdrawn.

Applicant's arguments, see Page 12, lines 13-16, filed 2 July 2008, with respect to the 35 U.S.C. 112, Second Paragraph rejection of at least claims 4, 6 and 11 have been fully considered and are persuasive. The rejection of at least claims 4, 6 and 11 has been withdrawn.

Applicant's arguments, see Page 14, lines 10-17, filed 2 July 2008, with respect to the 35 U.S.C. 103(a) rejection of claim 2 have been fully considered and are persuasive. As a result, the 35 U.S.C. 103(a) rejection of claims 2-4 has been withdrawn.

12. Applicant's other arguments filed 2 July 2008 have been fully considered but they are not persuasive.

With respect to at least claim 1, the Applicant argues that Flohr et al. fails to disclose the claimed limitation …

e) reconstruction of a computer tomography image of the object from the measured values, wherein only measured values whose acquisition times lie within the periods in time intervals are used, which are so determined that a similarity measure applied to intermediate

images of a same subregion of the object is minimized, wherein different intermediate images are reconstructed using measured values from time intervals from different periods.

The Examiner disagrees. Flohr et al. clearly discloses …

reconstruction of a computer tomography image of the object from the measured values (“***measured data*** proceed from the detector 3 to an electronic ***calculating unit 11*** that, using measuring points from sequences corresponding to the projections, ***reconstructs*** the attenuation coefficients of the ***picture elements*** of a picture element matrix and graphically reproduces this on a viewing monitor”, See Col. 6, lines 56-60),

wherein only measured values whose acquisition times lie within the periods in time intervals are used (“***only those data*** are employed for image reconstruction that were found to be ***acquired during a rest phase***”, See Col. 2, lines 26-27 and Figures 2, 4 and 5 where the periods of time are the rest phases of the heart as indicated in Figure 1 which can vary in duration as indicated in Figure 4 within which a selected image sequence can be reconstructed as indicated in Figure 5),

which are so determined that a similarity measure applied to intermediate images of a same subregion of the object is minimized (“an automatic interpretation of reconstructed images is also possible in the scope of the invention. When, for example, the ***differences of images*** succeeding one another in time exhibit a negligible extent of line artifacts or double contours, these images can be allocated to a resting phase of the heart. An uninterrupted sequence of images evaluated in this way as being low in motion artifacts then defines a resting phase of the heart", See Col. 5, line 67 - Col. 6, line 7),

wherein different intermediate images are reconstructed using measured values from time intervals from different periods ("The relative position of the mechanical ***resting phase*** of the heart in relation to the ECG signal can be ***determined with a reference examination (scan)***" and "Images that are to be allocated to immediately successive points in time are reconstructed from the measured data with respect to a suitable heart slice that cover ***at least one heart cycle, preferably a few heart cycles***, given at least one revolution, preferably a very few revolutions, of the x-ray source around the examination subject", See Col. 3, lines 59-67, "constants C_1 and C_2, which are fractions of the duration of the respective RR interval are ***patient specific***" where "Fig. 4 illustrates this procedure with reference to the example of RR intervals of ***variable duration***", See Col. 4, lines 31-49 and Figures 3-4. Flohr et al. goes on to say, "***Images*** from the overall reference examination are thereby calculated, for example ***by sub-revolution reconstruction***" and "An ***image sequence ... defines the rest phase***", See Col. 4, lines 50-63 and Figure 5. Note: Each rest phase is a different period. Each heart cycle has a rest phase and more than one heart cycle used. Intermediate images determined for each heart cycle to determine respective rest phase.).

In summary, each heart cycle has a rest phase and more than one heart cycle may be used to determine patient specific constants C1 and C2 that define rest phase of subsequent acquisitions. Each rest phase is a different period (occur at different times). Intermediate images are used to determine rest phase for heart cycle. Differences of images utilized as similarity measure from intermediate images. Therefore, Flohr et al. does disclose the limitations as claimed in step e). As a result, the Applicant's arguments are not persuasive and the claims remain rejected.

Furthermore, with respect to at least claim 1, it is noted that the features upon which applicant relies (i.e., "each intermediate image be reconstructed with measured values from a time interval in a corresponding different period and that the similarity measure be performed on two such images" and "reconstructing intermediate images, each with measured values from a time interval from corresponding different time periods") are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims.

Conclusion

13. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOHN M. CORBETT whose telephone number is (571)272-8284. The examiner can normally be reached on M-F 8 AM - 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward J. Glick can be reached on (571) 272-2490. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J. M. C./
Examiner, Art Unit 2882

/Chih-Cheng Glen Kao/
Primary Examiner, Art Unit 2882